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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/710,984	08/16/2004	Shekhar Bhansali	1372.187.PRC	9395

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EXAMINER
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ALANKO, ANITA KAREN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 04/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/710,984	Applicant(s) BHANSALI ET AL.	
	Examiner Anita K. Alanko	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 1/24/06 amdt.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1 and 4-14 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 4-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 August 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

*Drawings*

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the steps of creating a PN-junction throughout the surface of the wafer and then forming recessed areas characterized by the absence of the surface PN-junction must be clearly shown or the feature(s) canceled from the claim(s). No new matter should be entered. These claim limitations are shown, but the drawings are hard to read and therefore it is unclear where the p-type and n-type regions are, and where the presence/absence of the surface PN-junction is.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 4-14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is unclear how there can be an absence of a PN junction since the claim defines that a PN-junction is created throughout the surface of the wafer. Therefore, the metes and bounds of the claims are unclear. What is an "absence" of a PN junction? Do both p-type and n-type regions need to be removed, or only either the p-type or the n-type region?

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 4-7, 9, 11-12 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Ishida et al (US 5,830,777).

Ishida discloses a method comprising the steps of:

providing a silicon wafer 2;

diffusing the wafer with dopant (to form p<sup>+</sup> region 3, Fig.5), whereby the diffusion creates a PN-junction throughout the surface of the wafer (forming n-type layer 5, Fig.6);

providing a mask 20a (Fig. 5);

positioning the mask 20a in overlying relation to the surface of the wafer;

patterning a layer of oxide 22 on the surface of the wafer (with openings 22a, Fig. 7);

etching the wafer to create recessed areas 4 coincident with the patterned oxide (Fig. 10),

the recessed areas characterized by the absence of surface PN-junction (regions where openings 22a are before the doping step of Fig. 7);

hydrofluoric acid etching the wafer to form porous silicon 24 thereon, whereby the porous silicon is formed coincident with the surface area characterized by the absence of surface PN-junction (since the porous silicon is defined in part by the region 23);

subjecting the wafer surface to wet etching resulting in dissolution of the porous silicon (Fig. 10).

Note that the claims are not limited to a particular order of steps.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8, 10, 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishida et al (US 5,830,777).

The discussion of Ishida from above is repeated here.

As to claim 8, Ishida does not disclose how the oxide layer is formed. It would have been obvious to one with ordinary skill in the art to deposit the oxide by sputtering because it is a conventional, useful technique for oxide deposition.

As to claims 10 and 13-14, Ishida does not disclose how long the etching is conducted. The time depends on the desired effect- how much material is to be removed, how fast it should be removed, the temperature of the etchant. For example, the temperature of the etchant effects how quickly the etching is conducted. It would have been obvious to one with ordinary skill in the art to use the cited time in the method of Ishida because the time appears to reflect a result-effective variable which can be optimized. See MPEP 2144.05 IIB.

#### ***Response to Amendment***

The objection to the claims is withdrawn since claims 2-3 have been cancelled. The drawings are objected to, the claims are now rejected under 35 USC 112, 2<sup>nd</sup> paragraph and remain rejected over Ishida.

#### ***Response to Arguments***

Applicant's arguments filed 1/24/06 have been fully considered but they are not persuasive.

Applicant argues that Ishida does not etch the wafer to create recessed areas coincident with the patterned oxide. In response, since the claims have open comprising language and are not limited to any particular order, the recessed areas include the etching of porous silicon regions to form recesses 4.

Applicant argues that Ishida does not describe recessed areas characterized by the absence of a surface PN-junction. In response, these areas are defined by regions 23, which lack a surface PN-junction at that point in time prior to doping to form regions 23.

Applicant argues that Ishida lacks HF etching, whereby the porous silicon is formed coincident with the surface area characterized by the absence of the surface PN-junction. In response, porous silicon 24 is coincident with regions 23.

Applicant argues with respect to Fig.7 that Ishida describes creating a PN-junction between layer 23 and layer 5. In response, as correctly pointed out by applicant, this is a separate doping step, therefore as broadly interpreted, before the doping occurs – the surface region lacks a PN-junction.

Applicant argues that Ishida does not describe forming porous silicon in a surface area characterized by the absence of a surface PN-junction. In response, as broadly interpreted, the porous silicon is “characterized” by the absence of the surface PN-junction since it is defined by the region 23, which before doping to form 23 is a region with the absence of a surface PN-junction, and thus is “characterized” by it.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The cited art shows methods of etching porous silicon.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K. Alanko whose telephone number is 571-272-1458. The examiner can normally be reached on Mon-Fri until 2:30 pm (Wed until 11:30).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*Anita K. Alanko*  
Anita K Alanko  
Primary Examiner  
Art Unit 1765